TECHNOLOGY NEEDS/OPPORTUNITIES STATEMENT

MOISTURE MEASUREMENT ON STABILIZED MATERIAL FOR 3013 CONTAINER STORAGE

Identification No.: RL-NM-00-005
Date: November 2000

Program: Nuclear Materials Stabilization
OPS Office/Site: Richland Operations Office/Hanford Site
PBS No.: RL-CP03
Waste Stream: N/A
TSD Title: N/A
Operable Unit (if applicable): N/A
Waste Management Unit (if applicable): N/A
Facility: Plutonium Finishing Plant

Priority Rating:

This entry addresses the "Accelerated Cleanup: Paths to Closure (ACPC)" Priority:

____ 1. Critical to the success of the ACPC
_X_ 2. Provides substantial benefit to ACPC projects (e.g., moderate to high lifecycle cost savings or risk reduction, increased likelihood of compliance, increased assurance to avoid schedule delays)
____ 3. Provides opportunities for significant, but lower cost savings or risk reduction, and may reduce uncertainty in ACPC project success.

Need Title: Moisture measurement on stabilized material for 3013 container storage.

Need/Opportunity Category: *Technology Opportunity*

Need Description:

- Description: A thermal stabilization cycle is required by the 3013 standard, with a product that must meet a moisture measurement criteria of less than 0.5%. Until FY2001, testing was performed with a Loss on Ignition (LOI) analysis of a sample from each furnace batch. There are several issues that complicate the use of this LOI test to meet the 3013 requirements, including inability to distinguish the loss of volatile salts from moisture loss, offsets of weight loss due to moisture by weight gain due to oxidation changes or other reactions, and representative sampling difficulties. A technology that can provide more accurate indication of moisture content, either in a sample on in the entire 3013 batch, was needed.

- Background.: the LOI test has been used for decades as an indication of material stability before vault storage, with a fair degree of success. However, analytical methods that provide more direct measurement of moisture or hydrogenous material content are available and should be implemented to meet the 3013 standard, as the material is to be stored in welded thick walled containers where pressurization is undesirable. There are several moisture measurement methods being pursued by the DOE complex, including Supercritical Fluid Extraction and Neutron Moderation, and this technology need is documented to support the ongoing efforts in this arena.

A Supercritical Fluid Extraction system was implemented at the PFP but several issues with installation and qualification on the PFP materials have prevented full use of the analytical results. A Thermogravimetric Analysis system (TGA) has been installed and is providing results analogous to an LOI test. Improved moisture measurement technology is still desirable to provide crosschecks of TGA results and possibly more efficient sample transfer/timing.

- ***Schedule Requirements:*** The technology should be available in as soon as possible to support the ongoing operations on 3013 containers in the 234-5Z building.

Earliest Date Required: Now
Latest Date Required: N/A

Problem Description: See above.

Potential Life-Cycle Cost Savings of Need (in $000s) and Cost Savings Explanation: A specific cost savings is not proposed for this technology, as the full impact is difficult to judge. Avoidance of recycling thermal stabilization product unnecessarily due to misleading measurement results will be a large cost savings, as each furnace batch takes nearly three shifts to prepare and process, with a crew of at least three personnel. A significant recycle rate has been observed for impure materials, where the thermal stabilization cycles should easily be removing all moisture, but volatile salts are suspected of remaining in the product and causing high LOI results.

Benefit to the Project Baseline of Filling Need: A significant benefit can accrue if product recycle can be avoided. In addition, better quality assurance of the product being placed into 3013 containers will provide technical bases for the long-term storage of this material.

Relevant PBS Milestone: TRP-05-500 Complete stabilizing and packaging oxides > 30wt%

Functional Performance Requirements: Moisture measurement technology must be capable of detecting water in a variety of plutonium bearing materials, at a level of 0.5%, to meet the 3013 standard.

Work Breakdown Structure (WBS) No.:	***TIP No.:***
1.04.05.01.13	N/A

Justification For Need:

Technical: Measurement of actual moisture levels rather than an indirect LOI method is highly desirable, providing better quality indication of the product and avoiding false positive readings that cause recycle of stabilized material.

Regulatory: None.

Environmental Safety & Health: Glovebox operations, if required, must conform to criticality, ALARA, and human factors requirements.

Cultural/Stakeholder Concerns: None.

Other: N/A

Current Baseline Technology: Currently PFP uses a TGA test, however ongoing DOE complex discussions on moisture measurement techniques have not resolved whether this is the best analytical test to support DOE-STD 3013 Standard requirements. A Supercritical Fluid Extraction system is still available at the PFP should technical questions about its ability to provide accurate analyses of impure material be resolved.

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